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SMALL GLASS-MELTING FURNACES FOR CLEAR, TINTED, AND SPECIALIZED GLASS

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Data on the design and application areas of small-sized glass-melting furnaces for melting various-purpose glasses are supplied.

A technology for producing tinted and specialized glass in small glass-melters of different designs has been developed, based on research, development, and production experience.

The first group of furnaces includes gas and gas-electric continuous furnaces for melting clear and tinted glass and opacified glass using fluorine-containing materials, frits, and enamels. The specifics of these furnaces consists in their individual designs in relation to the composition of the glass to be melted and the molding method (Fig. 1*a*).

In this way, in order to produce glass tubing of various colors, even with modification of the main glass composition, it is possible to install tin oxide electrodes, which make it possible to produce glass with low diathermancy (for example, dark blue glass), as well as a glass melt discharge system for quick transitions to a different color (for example, for transition to opacified glass).

The glass melting process is designed as a certain sequence of glass color modifications, taking into account the chemical and technological specifics of particular compositions. For instance, the melting of manganese glass was carried out after chromium-containing compositions, as chromium oxide makes it possible to convert Mn^{2+} to the higher form of oxidation Mn^{3+}, which imparts a purple color to the glass. The transition to sulfide tinting can be carried out after melting cobalt glass (which is neutral with respect to redox processes).

The furnaces for melting such glasses are continuous flow-through tank furnaces equipped with a continuous glass melt feeding system for automatic molding or a working tank for manual setting, a device for agitation of the glass melt, and tin oxide or molybdenum electrodes, depending on the redox processes in the glass melt. The output of such furnaces ranges from 1.5 to 3.0 tons/day.

The next group of furnaces consists of gas-flame batch furnaces that use short-flame burners, are provided with a system for recapture of waste smoke gas heat, and use net

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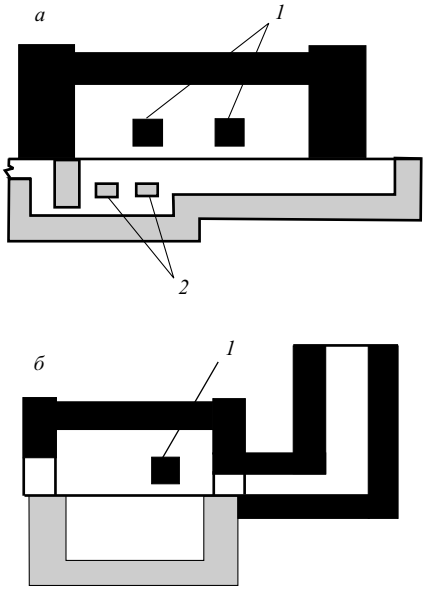

Fig. 1. Gas-electrical continuous furnace (*a*) and gas-flame batch furnace (*b*) for clear and tinted glass: *1*) gas burners; *2*) wall electrodes (the tank walls are made of refractory bricks).

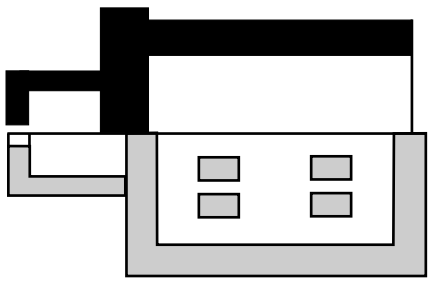

Fig. 2. Electric lining-slag continuous furnace.

screens as protection from radiation (Fig. 1*b*). The efficiency of such furnaces is 200 – 500 kg/day of glass melt.

Another noteworthy technology involves the melting of glass containing toxic and highly volatile components, for instance, lead-containing glass with different content of lead oxide (up to 80%).

Melting of the glass is carried out in slag-electrical continous furnaces (Fig. 2). In order to maintain the chemical composition of the glass, the technology provides for the formation of a lining slag layer on the inner surface of the tank walls: the melting-tank walls are designed as water coolers. In addition to the fixation of the slag layer, this ensures protection for the glass composition from the products of disintegration of the refractories, which could modify the physicochemical properties of the glass (viscosity, softening point, etc.). Since these glass compositions are used as coatings for glass products and nonferrous metals, all physicochemical properties ought to be stable. The output of small lining-slag furnaces for such glasses is 100 – 250 kg/day.

The extensive production experience of the factory and the support of engineers and scientists from the NIIStekla Institute make it possible to design furnaces for the melting of various glass compositions and different molding technologies. The factory can also manufacture individual units of the furnace, assemble, install, and heat up furnaces, and develop technological schedules and charts.